

WHAT IS CLAIMED IS:

1. A machine cell for the forming and joining of a first sheet material to a second sheet material, the first sheet material having a surface contour, the machine cell comprising:

    a lower nest for holding the first sheet material, said lower nest including a frame and an upper surface, said upper surface including a vacuum pad and a material-contacting portion, said material-contacting portion being defined to substantially cooperate with the surface contour of the first sheet material; and

    a vacuum system in fluid connection with said vacuum pad of said upper surface of said lower nest for holding the first sheet material during the joining of the first sheet material to the second sheet material.

2. The machine cell of Claim 1, further including an upper gate for holding the second sheet material.

3. The machine cell of Claim 1, wherein said vacuum pad includes at least one recessed channel and said vacuum system includes a plenum and at least one fluid line connecting said plenum to said at least one recessed channel.

4. The machine cell of Claim 3, wherein said vacuum system further includes a fluid line for fluidly connecting said plenum to a vacuum source.

5. The machine cell of Claim 1, wherein said lower nest further includes an alignment mechanism for aligning the upper sheet material to the lower sheet material.
6. The machine cell of Claim 5, wherein said alignment mechanism defines at least two crowders, each of said crowders including a pivoting alignment finger.
7. The machine cell of Claim 2, further including means for moving said upper gate relative to said lower nest.
8. The machine cell of Claim 2, wherein said upper gate includes at least one contact support shaft.
9. The machine cell of Claim 2, wherein said upper gate includes three spaced-apart contact support shafts.
10. The machine cell of Claim 8, wherein said at least one contact support shaft includes a contact plunger for contacting the second sheet material.
11. The machine cell of Claim 10, wherein said contact plunger includes a spring-loaded nose.
12. The machine cell of Claim 8, wherein the second sheet material has at least one alignment hole formed therein and said at least one contact plunger support

shaft includes at least one alignment pin for engagement with the at least one alignment hole formed in the second sheet material.

13. A machine cell for the forming and joining of a first sheet material to a second sheet material, the machine cell comprising:

a lower nest for holding the first sheet material, the lower nest including a vacuum pad for receiving the first sheet material; and

a vacuum system in fluid connection with said vacuum pad of said lower nest for holding the first sheet material during the joining of the first sheet material to the second sheet material.

14. The machine cell of Claim 13 further including an upper gate for holding the second sheet material.

15. The machine cell of Claim 13, wherein said vacuum pad includes an upper surface and at least one recessed channel defined therein and said vacuum system includes at least one fluid line fluidly connected to said at least one recessed channel.

16. The machine cell of Claim 15, wherein the first sheet material has a surface contour and said upper surface of said lower nest is defined by a material-contacting portion, said material-contacting portion being defined to substantially cooperate with the surface contour of the first sheet material.

17. The machine cell of Claim 16, wherein said lower nest further includes at least two crowders for aligning the upper sheet material to the lower sheet material, each of said at least two crowders includes a pivoting alignment finger.

18. The machine cell of Claim 14, wherein said upper gate includes at least one contact support shaft, said at least one contact support shaft including a contact plunger for contacting the second sheet material.

19. The machine cell of Claim 18, wherein the second sheet material has at least one alignment hole formed therein and said at least one contact plunger support shaft includes at least one alignment pin for engagement with the at least one alignment hole formed in the second sheet material.

20. A machine cell for the forming and joining of a first sheet material to a second sheet material, the first sheet material having a surface contour, the machine cell comprising:

a lower nest for holding the first sheet material, said lower nest including a frame and a vacuum pad, said vacuum pad including at least one recessed channel and a material-contacting portion, said material-contacting portion being defined to substantially cooperate with the surface contour of the first sheet material;

an upper gate for holding the second sheet material;

a vacuum system in fluid connection with said at least one recessed channel of said vacuum pad for holding the first sheet material during the joining of the first sheet material to the second sheet material, said vacuum system including a plenum and at least one fluid line connecting said plenum to said at least one recessed channel, said vacuum system further including a fluid line for fluidly connecting said plenum to a vacuum source.

21. A machine cell for the forming and joining of a first sheet material to a second sheet material, the first sheet material having a surface contour, the machine cell comprising:

a frame having a plurality of sidewalls, said frame having a first material contacting surface;

a vacuum pad supported by said frame, said vacuum pad having at least one cavity defined therein and a second material contacting surface; and

a vacuum source; and

a fluid line coupling said at least one cavity to said vacuum source.

22. The machine cell of Claim 21, wherein said at least one cavity is disposed within said frame.

23. The machine cell of Claim 21, further including at least one alignment mechanism fitted to said frame.

24. The machine cell of Claim 21, further including a central support disposed within said cavity.

25. The machine cell of Claim 21, wherein said cavity is an elongated channel.

26. The machine cell of Claim 21, wherein said frame has a base and said second material contacting surface is elevated with respect to said first material contacting surface relative to said base.

27. The machine cell of Claim 21, further including a forming tool, said forming tool being operative to effect forming of at least one of the first sheet material or the second sheet material.

28. A method for forming and joining of a first sheet material to a second sheet material, the method comprising:

forming a frame having a material condition portion and a vacuum chamber and having a vacuum source in communication with said vacuum chamber;

locating the first sheet material on said frame;

locating the second sheet material adjacent the first sheet material;

clamping the first sheet material to said frame by operating said vacuum source; and

operating a forming tool on at least one of the first sheet material or said second sheet material.

29. The method of Claim 28 including the step of fitting a sheet alignment mechanism to said frame and locating the first sheet material with said alignment mechanism.

30. The method of Claim 28 including the step of forming a gate to operate in conjunction with said frame and locating the second sheet material with said gate.